Trench Camp Property - Tailings Storage Facility (TSF)
Aquifer Protection Permit No. P-512235
Place ID 18640, LTF No. 83040
Significant Amendment

I. Introduction:

The Arizona Department of Environmental Quality (ADEQ) proposes to issue an Aquifer Protection Permit (APP) for the subject facility that covers the life of the facility, including operational, closure, and post-closure periods unless suspended or revoked pursuant to Arizona Administrative Code (A.A.C.) R18-9-A213. The requirements contained in this permit will allow the permittee to comply with the two key requirements of the Aquifer Protection Program: 1) meet Aquifer Water Quality Standards (AWQS) at the Point of Compliance (POC); and 2) demonstrate Best Available Demonstrated Control Technology (BADCT). BADCT's purpose is to employ engineering controls, processes, operating methods or other alternatives, including site-specific characteristics (i.e., the local subsurface geology), to reduce discharge of pollutants to the greatest degree achievable before they reach the aquifer or to prevent pollutants from reaching the aquifer.

II. Permittee & Facility Location:

Hermosa Project Property
749 Harshaw Road
Patagonia, Arizona 85624

III. Facility Description:

The Hermosa Project Property is located approximately 5 miles south of the Town of Patagonia, Arizona. Arizona Minerals Inc. (AMI) purchased the historic, January and Norton Mine Claims and the Trench Camp Mine claims and associated Tailings Pile/waste rock from the ASARCO Trust in early 2016. The historic Mine Claims are closed and not considered APP regulated facilities and thus exempt according to the Arizona Revised Statue (A.R.S.) § 49 -201.7 and A.R.S. § 49-250.B.11. The original APP application has been submitted for APP-regulated discharges associated with ADEQ's Voluntary Remediation Program (VRP) project related to eliminating discharges of mine impacted water from January Adit mine workings and tailing piles (which includes potentially acid generating (PAG) waste rock) seepage to Alum Gulch. The permit is being amended for purposes described further below.

The Trench Camp historic tailings piles (1 through 4) were located within an unlined natural basin in a three pile configuration. Tailings Pile #1 contained tailings and potential acid generating (PAG) waste rock. Stockpile #2 and #4 contained only tailings and have been combined into one pile referred to as Tailings Pile #2 and are generally divided by the 5,100 foot contour elevation. In addition, Tailings Pile # 3 contained only tailings. These tailings piles were moved onto the Trench Camp TSF under the terms of the APP and VRP.

The Trench Camp TSF is designed as a lined, dry-stack permanent storage area for the remediation of the existing tailings piles, described above. Placement of the existing tailings piles on the lined permanent containment is part of the VRP program in Arizona under the site code 505143-2. Tailings, PAG waste rock and impacted soils beneath the existing tailings piles are to be excavated

and placed in the lined Trench Camp TSF as an earthen material. PAG development rock from site surface construction and from a planned exploration decline or shaft, solids from the water treatment plants (WTP1 and WTP2), core cuttings, drill cuttings, and stormwater best management practices (BMPs) solids will also be stored in the lined TSF as a co-mingled material with the existing tailings and PAG waste rock. Additionally, the development rock may be placed on the exterior face of the existing tailings and PAG waste rock thereby acting as rock armor, to prevent water and wind erosion prior to closure.

The Trench Camp TSF shall be constructed in three stages; construction began in 2018. The TSF consists of a lined tailings storage facility, two stormwater detention ponds and an underdrain collection pond. The process solutions in the Trench Camp TSF will be collected through an underground collection system and gravity fed to the double lined underdrain collection pond (UCP). The UCP will be constructed downgradient of the Trench Camp TSF. The captured process solutions, precipitation that falls within the UCP and water from the January Adit (the January and Norton Mine Claims) will be piped to an active WTP for processing and discharge to Alum Gulch under AZPDES permit No AZ0026387.

Interim Stage

The materials from Tailings Pile #1, which included 225,000 cubic yards of tailings, waste rock, and native material were excavated, hauled and temporarily placed on Tailings Piles #2 and #4 in order to provide space for the construction of the Stage 1 TSF. The temporary placement of Tailing Pile #1 on Tailings Piles #2 and #4 consisted of approximately 5H:1V (horizontal:vertical) slopes, a 50 foot setback from the brow of the existing slope on Tailings Pile #2, and an approximate maximum height of 30 ft.

Stage 1

Stage 1 of the Trench Camp TSF was constructed and utilizes approximately 650,000 square feet (ft2) of lined containment. Approximately 950,000 cubic yards of tailings, waste rock and native material were excavated, hauled, placed and compacted within the lined Stage 1 Trench Camp TSF from temporary Tailings Pile #1 and Tailings Piles #2 and #4. This volume includes the 225,000 cubic yards of Interim Stage material discussed above.

Stage 2

Stage 2 of the Trench Camp TSF was constructed after Stage 1 and utilizes approximately 596,000 ft2 of additional lined containment. Approximately 280,500 cubic yards of additional tailings, waste rock and native material were excavated, hauled, placed and compacted within the lined Stage 2 Trench Camp TSF from Tailings Piles #2 and #4, and Tailings Pile #3. All historic tailings, waste rock and native materials from Tailings Piles #1, #2, #3 and #4 have been relocated within the constructed Stage 1 and 2 TSF lined containment as a compacted earthen fill totaling approximately 1,230,500 cubic yards.

To complete the design stacking geometry, approximately 1,400,000 cubic yards of additional material including exploration decline or shaft development rock (approximately 932,092 cubic yards), filter cake from WTP1 (approximately 20,097 cubic yards) and WTP2 (approximately 14,949 cubic yards), core cutting solids (approximately 105 cubic yards), drill cuttings (approximately 5 cubic yards), construction PAG rock (approximately 385,051 cubic yards), and

sediments from stormwater control features (approximately 9,000 cubic yards), will be placed in the Trench Camp TSF. These volumes are estimates only, but reflect the overall proportion of each type of material expected to be placed into the TSF. The actual volumes of the various materials placed in the TSF may vary so long as all placement requirements are met for each material type (see Section 2.2.1.1) and the elevation of the completed TSF does not exceed 5,175 feet. All materials will be placed within the existing lined Stage 1 and Stage 2 TSF footprint.

IV. Amendment Description:

The purpose of this significant amendment is to make the following revisions to the APP:

- To authorize discharge from a new water treatment plant (WTP2) with a proposed discharge to a channel that will convey the discharge to ephemeral Harshaw Creek (Outfall 002). Outfall 002 would be permitted as a second surface discharge location at the mine site under the Arizona Pollutant Discharge Elimination System (AZPDES) program. The treatment techniques incorporated into proposed WTP2 would serve as the best available demonstrated control technology (BADCT) for this proposed discharge. AMI also has submitted an AZPDES permit application for the discharge at Outfall 002.
- Revise the TSF design to increase the maximum elevation by 65 feet; i.e. from the current permitted elevation of 5,110 feet to 5,175 feet above mean sea level (AMSL), and revise the stacking geometry with no expansion of the currently permitted footprint. A total of 950,000 cubic yards (inclusive of "Interim Stage") of material were placed during "Stage 1", and 280,500 cubic yards of material were placed during "Stage 2" for a total of 1,230,500 cubic yards. The proposed TSF Amended Design includes 1,400,000 cubic yards of storage capacity in addition to the existing volume that has already been placed as a result of VRP implementation, thus bringing the total volume of material to be placed on the TSF to 2,630,500 cubic yards. Materials proposed to be placed on the TSF include exploration decline or shaft development rock, PAG construction rock, water treatment plant solids, drill cuttings, and solids from stormwater best management practices (BMPs). The amended design for the TSF incorporates a lateral and vertical stacking expansion to the constructed TSF that remains within the currently permitted TSF footprint. The existing basin liner will not require any alteration.
- Revise the Pollutant Management Area (PMA) and Discharge Impact Area (DIA) to reflect the additional surface discharge to Harshaw Creek. The revised PMA along Harshaw Creek was based on the maximum design flow of 4,500 gpm from the WTP2 outfall, stream channel geometry, and variable infiltration rates along Harshaw Creek. This resulted in a travel distance of 9.4 miles from the outfall, which also defined the downstream extent of the PMA.

  The DIA along Harshaw Creek is defined as the lateral extent of the alluvium between the stream channel and the bedrock boundaries, as estimated from aerial imagery, USGS topographic maps, and field reconnaissance. Surface water flow near the downstream limit of the PMA will enter a reach that is not bounded by bedrock but rather overlies basin fill sediment. It's at this point, 9.4 miles downstream of the outfall, that Harshaw Creek transitions from a narrow channel in the highlands area to a broad alluvial plain, which defines the northern extent of the PMA. Recharge and mounding effects from recharge were modeled using the Aqtesolv© software package. Groundwater flow, based

on the groundwater mounding output and the Darcy velocity, was estimated to extend an additional 1,424 ft beyond the PMA.

- Update closure costs and financial assurance mechanism (see below).
- Correct a minor permit condition associated with piezometers for the Underdrain Collection Pond (UCP) that was included in error in the original permit. Based on an email from Arizona Minerals, Inc. dated September 1, 2020, these piezometers are present not to ensure stability of the embankment but rather to serve as a backup system "to provide additional data in the event of a lining system failure."

The closure and post-closure costs were increased from $7,939,380 in the current permit (closure costs of $2,130,908, and post-closure costs of $5,808,472) to $13,920,872. The revised closure costs were estimated to be $5,600,685, and the post-closure costs were estimated to be $8,320,187 for a total of $13,920,872.

This application was processed as a "significant" amendment as per the following:

- A.A.C. R18-9-A211(B)(2)(a) – related to an increase of 10 percent or more in the permitted volume of pollutants discharged. The additional 1,400,000 cubic yards of material to be placed on the TSF is more than 10 percent of pollutants added to the TSF.
- A.A.C. R18-9-A211(B)(8) – related to addition to or a substantial change in closure requirements or to provide for post-closure maintenance and monitoring (see above paragraph related to increase in closure and post-closure costs).
- A.A.C. R18-9-A211(B)(9) – related to material and substantial alterations or additions to a permitted facility, including a change in disposal method, justify a change in permit conditions.

V. Regulatory Status:

The most recent inspection dated March 12, 2019 indicated that the facility was found to be in compliance with the APP and Arizona rules and statutes.

VI. Best Available Demonstrated Control Technology (BADCT):

The Trench Camp TSF and the UCP will employ prescriptive BADCT components (in accordance with the Arizona Mining BADCT Guidance Manual (AMBGM)). BADCT has been determined in accordance with the AMBGM. The design of the UCP incorporates enhanced discharge control measures (such as double liner and leak collection and recovery systems) that go beyond the prescriptive components identified in the AMBGM for non-stormwater impoundments.

Stage1 of the project has been completed. As described under the Amendment Description section above, this amendment permits placement of additional materials including: exploration decline or shaft development rock (approximately 932,092 cubic yards), filter cake from WTP1 (approximately 20,097 cubic yards) and WTP2 (approximately 14,949 cubic yards), core cutting solids (approximately 105 cubic yards), drill cuttings (approximately 5 cubic yards), construction PAG rock (approximately 385,051 cubic yards), and sediments from stormwater BMPs (approximately 9,000 cubic yards).

Stage 2

The Stage 2 TSF shall be constructed in a manner similar to that of Stage 1 TSF. The permittee may use geosynthetic clay liner (GCL) in lieu of the LPSL if field conditions allow its use and it is approved by the design engineer. The maximum elevation of the Stage 2 TSF shall match up with the Stage 1 TSF elevation and shall not exceed 5,110 ft. During the Stage 2 construction, the 2.6 ac. ft. internal detention basin located at the northwestern portion was expanded to contain a volume of 3,258,514 gallons (10 ac. ft.) of contact stormwater, and another 260,681 gallons (0.8 ac. ft.) internal detention basin will be constructed in the eastern portion of the Stage 2 TSF. The 1.5 ac. ft. internal detention basin located at the northeastern portion of the Stage I TSF has been covered by materials deposited in this stage.

A geomembrane lined external stormwater detention basin having the capacity of 3.2 million gallons (9.82 ac. ft.) to detain upstream unimpacted runoff on the east side of Stage 2 has been constructed. The unimpacted runoff captured in this detention pond shall be pumped around the TSF until closure is substantially complete.

A minimum of 4 piezometers have been installed immediately adjacent to the geomembrane surface within the protective layer next to an underdrain collection pipe within the TSF to measure hydraulic head on the liner system, at the locations and as per the design submitted in the application. The phreatic surface in these piezometers shall be maintained below 1.5 feet

The permittee is allowed to place additional materials including solids from WTP1 and WTP2, core cutting solids, drill cuttings and sediment from stormwater BMPs. The placement of the solids shall be in accordance with the recommendations and following all quality control and quality assurance procedures (QA/QC) made in the Attachment C of the application dated August 14, 2020.

Solids from WTP

Filter cake from WTP1 is currently stored on the TSF. Recently-permitted upgrades to WTP1 will result in additional filter cake solids at approximately 3,650 cubic yards per year. The solids shall be hauled to the TSF in approximately 20 cubic yard increments.

WTP2 filter cake is anticipated to be hauled and placed in the TSF at a rate of approximately 4,380 cubic yards per year from the stage one filter press and approximately 146 cubic yards per year from the stage two filter press for an aggregate total of approximately 4,526 cubic yards per year. It will be hauled to the TSF in approximately 20 cubic yard increments. WTP2 filter cake material properties are assumed to be similar in nature to WTP1 filter cake and therefore the placement criteria are the same for both filter cake products.

The anticipated material properties are as follows based on a control sample obtained November 20th, 2019:

- 100 percent passing (by dry weight) the no. 200 sieve.
- Non-plastic soil.
- Moisture content will be 363% (based on dry weight of solids) upon arrival to the TSF.

Upon placement on the TSF, filter cake from WTP1 and WTP2 shall be spread and dried to reduce the material moisture content. The filter cake shall then be mixed with tailings, on site native borrow material and/or development rock at a minimum ratio of 3:1 (tailings/on site native borrow/development rock to filter cake). After mixing, the material shall be moisture conditioned to within 2 percent below and 3 percent above the optimum moisture content. The material shall be placed in 12-inch maximum loose lifts and compacted to 90 percent of the maximum dry density as determined by ASTM D698.

Core-cutting solids

Approximately 12 cubic yards per year of core cutting solids will be placed on the TSF. This material simply consists of rock fragments generated from cutting of core. Upon placement in the TSF, the core cutting material shall be spread and dried to reduce the material moisture content. The core cutting material shall then be mixed with tailings, on site native borrow material and/or development rock at a minimum ratio of 3:1 (tailings/on site native borrow/development rock to core cutting material). After mixing, the material shall be moisture conditioned to within 2 percent below and 3 percent above the optimum moisture content. The material shall be placed in 12-inch maximum loose lifts and compacted to 90 percent of the maximum dry density as determined by ASTM D698.

Drill Cuttings

The drill cutting material that is generated from exploration activities is anticipated to be hauled and placed in the TSF at a rate of less than 1 cubic yard per year. Upon placement in the TSF, the drill cutting material shall be spread and dried to reduce the material moisture content. The drill cutting material shall then be mixed with tailings, on site native borrow material and/or development rock at a minimum ratio of 3 (tailings/on site native borrow/development rock) to 1 (drill cutting material). After mixing, the material shall be placed in 12-inch maximum loose lifts and compacted to 90 percent of the maximum dry density as determined by ASTM D698.

Solids from Stormwater BMPs

The sediments generated from site stormwater best management practices (BMPs) is anticipated to be hauled and placed in the TSF at a rate of approximately 1,800 cubic yards per year. The material is assumed to comprise of gravel, sand, silt and clay. Upon placement in the TSF, the sediments shall be spread and dried to reduce the material moisture content. The sediments shall then be mixed with tailings, on site native borrow material and/or development rock at a minimum ratio of 3 (tailings/on site native borrow/ development rock) to 1 (sediment). After mixing, the material shall be placed in 12-inch maximum loose lifts and compacted to 90 percent of the maximum dry density as determined by ASTM D698.

Water Treatment Plant 1 (WTP1)

The WTP is designed for treating underdrain seepage and storm water runoff from the TSF and water from the January Adit mine workings. The flow rate from the UCP and the January Adit mine workings are anticipated to fluctuate up to a maximum of 120 gallons per minute (gpm) from each source, with a maximum combined flow from both sources not to exceed 120 gpm.

The WTP process consists of pH adjustment to 10.5 followed by liquid/solids separation. This process includes various elements including: an equalization tank, a multiflo tank (consisting of

reaction, flocculation, and clarifier compartments), an ultrafiltration unit, a pH adjustment tank, a Moving Bed Biofilm Reactor (for treatment of residual ammonia), an electro-reduction circuit (for selenite removal), a thickening tank, a filtrate tank, and a filter press.

Treated water may be used for on-going mine exploration, construction soil conditioning, and future milling and mining operations. Periodic, short-term discharge of treated water or a portion of treated water to Alum Gulch may be necessary during periods of exploration or mine development. Releases from the WTP are authorized under an AZPDES permit.

Water Treatment Plant 2 (WTP2)

WTP2 is designed for treating groundwater pumped from a wellfield to depressurize and dewater the fractured rock aquifer, groundwater and operational water pumped from underground workings, tailing seepage and January Adit water, treated water from WTP1, drilling water and core cutting water, and water from stormwater BMPs. The maximum design flow is 4500 gpm.

WTP2 consists of two treatment circuits. The first circuit will remove suspended solids (TSS) and metals. The second circuit will remove selenate (a species of selenium not removed in the first circuit) and consists of an IX ion exchange column circuit and an Electro Reduction Circuit.

Treated water may be used for on-going mine exploration, construction soil conditioning, and future milling and mining operations. Releases from WTP2 to Harshaw Creek are authorized under an AZPDES permit.

VII. Compliance with Aquifer Water Quality Standards (AWQS):

The permittee shall conduct Compliance Groundwater monitoring at MW3, located approximately 300 feet downgradient of the AZPDES Outfall-001 as per Section 4.2, Table 4.2.3.

Discharge Monitoring:

Compliance discharge monitoring shall be conducted for quality and daily flow from the WTP at AZPDES Outfall 001 and AZPDES Outfall 002 per Section 4.2, Table 4.2.2 of the permit.

Other Monitoring:

Table 4.2.1 – Facility Inspections includes seepage monitoring of the piezometer wells at the Tailings Storage Facility (TSF) and shall be monitored for water levels and presence/absence of fluids.

Facility Inspections also include:

TSF: Tailings height, and structural integrity.

UCP: Freeboard, anchor trench integrity, embankment integrity, liner integrity, pumping system integrity, sediment control.